Introduction

Aquatic Invasive Species That Threaten Utah

Aquatic invasive species (AIS) are not strangers to Utah. In fact, numerous AIS species now inhabit Utah or threaten the state with immediate arrival. The list includes pathogens (many), fungi (1 species), algae (1 species), plants (5 species), mollusks (6 species), crustaceans (4 species), fish (3 species), amphibians (4 species) and reptiles (1 species) (Appendix A). Some have been present almost since the initial arrival of the pioneers to Utah in the mid 1800s, and the numbers of different species, their abundance, and their distribution seems to be on a constant march upward. AIS are defined as water-associated non-native plant and animal species that threaten the diversity or abundance of native species due to their uncontrollable population growth, causing ecological instability of infested waters, or economic damage to commercial, agricultural, aquacultural, or recreational activities dependent on such waters.

The term AIS in many documents and laws is referenced as Aquatic Nuisance Species; for purposes of this plan both aquatic invasive species and aquatic nuisance species mean the same thing. AIS are defined in part as non-native. However, not all non-native species are viewed as a nuisance, since many are not invasive. Some non-native species support human livelihoods or a preferred quality of life, although they can in some situations have adverse impacts on desired species (e.g. sport fish impacts on sensitive species). Regarding this plan, Figure 1 identifies the boundaries for the State of Utah, which is the plan's effective area. Major water courses and water bodies are identified on the map along with locations where watercraft interdiction and decontamination efforts occur under existing funding and authority. About one-half of Utah drains into the Green River and Colorado River drainage basins and the other half drains into the Great Basin, of which the Great Salt Lake is the most significant feature. A very small portion of Utah (Raft River Mountains in northwest Utah) drains north into the Columbia River Basin's Snake River.

Populations of AIS across North America have expanded, spreading rapidly due to lack of natural controls, and their ability to adapt to a variety of habitats. AIS are known to cause significant ecological and socio-economic problems throughout the world. Just within North America, populations of AIS, such as *Dreissenid* mussel species (quagga mussel *Dreissena bugensis,* zebra mussel *Dreissena polymorpha*, dark falsemussel *Mytilopsis leucophaeta)*, New Zealand mudsnail *Potamopyrgus antipodarum*, Eurasian watermilfoil *Myriophyllum spicatum*, and parasites or diseases that attack aquatic animals, are increasing in prevalence. These and other AIS species either exist or are threatening to arrive in North America, and many will eventually threaten Utah, too. Species accounts for those that either already exist in Utah or threaten to arrive can be pursued in Appendix A. Each account addresses species specific ecology; distribution in Utah, including a map for most species; pathways of introduction; management considerations; and the literature that was used to develop the species account. This appendix will be ever changing due to the potential addition of more species and the advancement of knowledge concerning pathways of introduction and management considerations with associated literature references.

Problem Definition and Ranking--Why Manage Aquatic Invasive Species in Utah
AIS are simply bad for Utah's environment and economy for a multitude of reasons. AIS challenge our native species, resulting in additional predation, out-competing them for food, displacing them from natural habitats or infecting them with disease. AIS obstruct flow in waterways, impacting municipal, industrial, and irrigation water supply delivery. AIS degrade ecosystems, reducing or threatening recreational or commercial fishing opportunities. And, AIS can cause wildlife and public health problems. These reasons are not all-inclusive, but alone they give cause for serious concern and need for aggressive management.

There are a multitude of pathways by which AIS have arrived in Utah. The most likely pathways are discussed for each AIS species in Appendix A. Unfortunately, little is know about exactly how any of the AIS actually arrived, leaving conclusions to mere speculation. The pet trade and unlawful aquarium discards; unlawful fish releases as bait discards; unlawful transfers of fish by anglers; inadvertent transfers by biota being attached to recreational equipment; and diversion of water, spreading its flow across Utah are likely pathways. Wild land fire control could represent a pathway, too, but the federal and state agencies responsible for fire suppression have very good protocols that consider AIS movement. Proper education of the public will aid in the reduction for movement of AIS.

The flow of water is virtually an uncontrollable pathway. Today, scientific knowledge is lacking on how to treat many AIS in open water systems and in particular, how to stop their downstream drift with movement of water in natural systems. Already, headwaters of the Colorado River, which are located in Colorado, are impacted with Dreissenid mussels. Although the state of Colorado is developing an AIS management plan, and they have a very good on-the-ground AIS management program, Colorado River flow will bring *Dreissenid* veligers to Utah, diming hopes of keeping Lake Powell free of *Dreissenid* mussels. New Mexico, from which the San Juan River originates and flows into Lake Powell, has an approved AIS management plan, but they are only beginning to put a program on-the-ground. Arizona does not flow water to Utah, but is planning to become more involved in AIS prevention at Lake Powell. Fortunately, the National Park Service at Glen Canyon National Recreation Area, which includes Lake Powell, developed a very good Dreissenid Mussel Management Plan in 2007; Utah Division of Wildlife Resources and Arizona Game and Fish were signatory participants to that plan.

The Green River is not yet infested with *Dreissenids*, but New Zealand mudsnail and burbot are present, likely having arrived in Utah from upstream, out-of-state ends of Flaming Gorge Reservoir and the Green River in Wyoming. Wyoming Game & Fish has neither an AIS management plan nor a suitable on-the-ground AIS program, although they continue to make progress. Wyoming is aggressively pursuing AIS authority and an operational budget from their 2010 Legislature. Recent (2008 and 2009) Dreissenid mussel interdictions in Wyoming and Utah at Flaming Gorge Reservoir have been pivotal in spurring Wyoming Game and Fish to action.

Idaho has an approved AIS management plan, which would include Bear Lake and the Bear River, which flow into Utah's Great Salt Lake. (Note: The Bear River originates in Utah and flows through a segment of Wyoming en route to Idaho.) Idaho only recently (2009 Legislature) became authorized and funded to do AIS work; they continue to be a valued ally relative to AIS.

Other river flows from outside of Utah (e.g. Nevada and minor tributary drainages of the other surrounding states) are primarily intermittent and remain unchallenged by AIS, but the threat for their inoculation is constant. No other overlapping AIS management plans or programs exist within Utah, although AIS management efforts within surrounding states and ongoing collaboration amongst the many entities with authority to manage AIS are ongoing and essential for a secure future. Utah Division of Wildlife Resources routinely coordinates with all the western states and other land management agencies, including water conservancy districts, regarding the *Dreissenid* mussels and other AIS issues. Utah has taken opportunity to coordinate with mid western and eastern states in order to better understand the *Dreissenid* mussel threat.

For Utah, the concern about AIS increased dramatically in the early 1990s with the arrival of Whirling Disease. Then, the alarm rang loudly when quagga mussels were discovered in Lake Mead, Nevada during January 2007. Soon thereafter the Utah Department of Natural Resources began an assessment of threats to Utah by *Dreissenid* mussels, and put policy NR-07-D-11 (Appendix B) into effect to prevent invasion of *Dreissenid* mussels into Utah's waters. The policy assigned the Utah Division of Wildlife Resources as lead agency within Utah to carryout such a program. Concurrently, Utah Division of Wildlife Resources implemented a Quagga Mussel Education and Implementation Plan (Appendix C), which was the precursor for this plan, for purposes of informing the public about threats and impacts from a *Dreissenid* mussel infestation. A specific target for outreach in the education plan was the boating public and decision makers who had authority to make funds available for plan implementation. The education plan also facilitated ongoing Utah Division of Wildlife Resources' interdiction of watercraft transporting AIS (71,000+ boats in 2008), leading to many decontaminations of infested boats and equipment (800+ boats in 2008).

The aforementioned efforts were not Utah's first steps at AIS management, but they certainly represented a rapidly changing attitude that AIS, particularly the *Dreissenid* mussel threat, would require a focused, well funded effort to achieve satisfactory management results. Prior to 2007, the Utah Division of Wildlife Resources only committed a small portion of one staff person's time to the AIS problem, although biologists statewide occasionally directed their efforts toward specific local issues (e.g. tamarisk control, common reed control and limited public education about AIS). Utah Division of Wildlife Resources' Fish Experiment Station in Logan, Utah for decades has provided strong, national leadership in the fight against aquatic pathogens and innovations in fish culture. Universities, tribal, federal, state and local government agencies, including private interests and organized sportsman groups in Utah also have on occasion directed some effort toward different AIS problems. And, the Utah Department of Agriculture and Food's Fish Health Board (Utah Division of Wildlife

Resources sits with this board) is the lead agency endeavoring to regulate aquatic animal and pathogen movement into and within Utah.

Dreissenid mussels are the highest priority AIS issue in Utah and are the primary focus of this plan. These invasive mussels due to their bio-fouling character would have significant impacts on the flow of water through Utah's complicated and widespread water distribution systems, causing significant economic harm. Additionally, they would negatively impact Utah's world class fisheries due to their filtering capabilities, robbing food literally from the mouth's of Utah's fish. The mussels would also impact Utah's water-based outdoor recreation areas, due to the mussel's foul odor when rotting on exposed beaches, which would occur during routine draw down of reservoirs for irrigation, municipal and industrial purposes. These impacts would significantly harm Utah's economy, since outdoor recreation (hunting, fishing & boating) represents the 2nd largest industry in Utah, following tourism. The growing threat from a discovered, but well established quagga mussel population during early 2007 in the lower Colorado River drainage spurred the State of Utah to an accelerated level of AIS action. It was the "straw that broke the camel's back."

Again, the AIS problem increased in late 2007 when a population of zebra mussel was found in Pueblo Reservoir in south-central Colorado. Also in 2007 zebra mussels were discovered in San Justo Reservoir in central California. 2008 resulted in discovery of quagga and zebra mussels in the headwaters (Lake Granby, Grand Lake, Shadow Mountain Reservoir and Willow Basin Reservoir) of the Colorado River in Rocky Mountain National Park, Colorado. More discoveries of quagga followed in 2008 at Tarrayl Reservoir and Jumbo Reservoir, Colorado. And, the determination in late 2008 when zebra mussel were detected at Utah's Electric Lake in Emery County and quagga mussel were detected at Red Fleet Reservoir in Uintah County were devastating discoveries. No doubt, more finds of *Dreissenid* mussels across the west will occur into the future.

Regarding *Dreissenid* mussels, Utah Division of Wildlife Resources' protocol and classification system for determining affected waters follows:

> **(1) Not Tested or Negative:** A plankton sample analyzed via cross-polarized microscopy and light microscopy shows no evidence of veligers or a water body has simply not been tested.
> **(2) Inconclusive:** A plankton sample evidences a preliminary finding of veligers by cross-polarized microscopy and light microscopy, but cannot be confirmed by two independent PCR methods.
> **(3) Detected:** A plankton sample evidences a preliminary finding of veligers by cross-polarized microscopy and light microscopy, and the finding is confirmed by two independent PCR methods. No juvenile or adults mussels are present.
> **(4) Infested:** Juvenile or adult mussels are present and a preliminary species confirmation is made by two experts, followed by two independent PCR methods for verification.

The second highest priority group of AIS species is New Zealand mudsnail and Eurasian

watermilfoil. New Zealand mudsnail populations seemed to proliferate all over the state during the mid 2000s, possibly moving through irrigation systems and on the soles of angler's felt-soled waders. The mudsnail seems to be spreading rapidly. Utah worries about their potential impacts on native benthic species. Additionally, it is believed that high density populations of mudsnail will compromise Utah's fish hatcheries and riverine fisheries with corresponding economic impacts. In late 2007 a population of New Zealand mudsnail was found in southern Utah's Loa State Fish Hatchery, causing it to be quarantined. A New Zealand mudsnail management plan for the hatchery was written, implemented, and decontamination is underway (Appendix D). New Zealand mudsnail have since been discovered in early 2008 on the grounds of central Utah's Midway State Hatchery; fortunately, the mudsnail are not yet inside the hatchery facilities. (**Note:** Individual hatchery Hazard Analysis Critical Control Point plans are in place for every state hatchery.) Utah Division of Wildlife Resources' AIS biologists and others have found New Zealand mud snails in river and stream segments previously not known as infested. Verification of preliminary New Zealand mudsnail identifications have been verified by Utah's Natural Heritage Program.

Eurasian watermilfoil is just beginning to take hold in Utah and will plug-up water control structures, impacting water delivery in Utah, impacting irrigation, municipal and industrial water supplies. The watermilfoil will also make littoral areas on our lakes and reservoirs non-useable to boaters. Anglers and boaters are easily deterred from their recreational quests due to the intense competition for folks leisure time. Both impacts will harm Utah's economy, which is strongly based upon our water resources.

Eurasian watermilfoil during the early to mid 1990s became established in northern Utah's Mantua Reservoir and southern Utah's Fish Lake; it's spreading primarily due to recreational boats. Biologists in Utah Division of Wildlfie Resources' aquatic section, aided by Utah Aquatic Invasive Species Task Force partners, are moving forward to spray treat Eurasian watermilfoil in Mantua Reservoir and Fish Lake. Re-treatments will re-occur as needed.

The other AIS (see Appendix A), although of importance, are of lesser consideration and rank as the third highest priority group. Mostly, the remaining species, including those being assessed for potential designation as AIS, may compromise Utah's native wildlife populations. To date none are pressing a native species into a situation of listing under authority of the Endangered Species Act, although common carp (not designated as AIS) challenge recovery of June sucker (*Chasmistes liorus*). Fortunately, the June sucker and the carp only co-exist in Utah Lake, which is the endemic home to the sucker, and a significant recovery effort is ongoing that in part targets carp removal. Additionally, spray treatment followed by burning of common reed (*Phragmites* spp.) throughout Utah's wetlands along the east side of the Great Salt Lake and other places has been ongoing for several years due to the efforts of the Utah Division of Wildlife Resources' waterfowl personnel. Likewise, tamarisk treatment statewide has been ongoing for years; multiple agencies endeavor in this quest. Utah Aquatic Invasive Species Task Force partners have been participants to varying degrees across the years, too, in AIS management, involving several species—priorities have been set office-by-office.

Hopefully, this plan will re-focus the prioritization into a cohesive effort.

The reason for this third level ranking is driven not so much by lack of authority by the Utah Aquatic Invasive Species Task Force members to deal with the various AIS, but by a lack of available funds. The *Dreissenid* situation in the west spurred Utah Division of Wildlife Resources to secure authority and funds, allowing the state to draw together a task force to deal with AIS. No agency was significantly involved prior to the task force being formed in January 2008, but funds for widespread AIS management remain lacking.

Utah's 2008 Legislature recognized the extreme threat of *Dreissenids* to the state's water delivery infrastructure and the threat to Utah's world class fishery resources. They have not yet perceived an equivalent threat from the other AIS. With that being said, the boaters seem to be a common denominator in AIS spread, and decontamination protocols specified within this plan will kill all AIS threatening Utah. Thus, Utah's boaters are being strongly urged to routinely decontaminate their watercraft after each use, allowing an attack on all three priority groups of AIS. The threats and impacts from the multitude of AIS already in the state, not to mention those on their way, are fully recognized as needing more attention.

What's at Stake in Utah--Economic and Ecologic Impacts

Degradation by AIS of Utah's aquatic wildlife resources (species, habitats and water-based recreation areas) may well imperil not only those resources, but the economy of local communities in the state. Certainly, the compromising of sensitive species in Utah by AIS could lead to additional listings under the Endangered Species Act, which represents a failing for individual species' population health and welfare. Such action has the potential to hamper economic development in local communities, since compliance with conservation actions driven by the Endangered Species Act can be mandated. Sometimes compliance is costly, nonetheless important and needed, but it is not uncommon for development plans to be delayed or altered in order to meet Endangered Species Act compliance.

Additionally, anglers who fished in Utah since 1995, including anglers across the nation over the last two decades, have shown a propensity to redirect their recreational endeavors to something other than fishing when inconvenienced by difficult regulations, poor success, poor quality fish, or an unpleasant fishing experience (Dalton 2003 and 2005; U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau 1991, 1996, 2001 and 2006). *Dreissenid* mussels and other AIS will lead to all of those situations. Once anglers quit the sport, it is very difficult to get them to return, which is evidenced by a slight decrease in fishing license sales in Utah. Aquatic conservation by the Utah Division of Wildlife Resources is mostly funded by angler's purchase of fishing licenses and angler associated federal aid to the state. Expenditure by the 375,311 anglers who fished in Utah during 2006 for goods and services that supported their angling efforts exceeded $708 million, supporting more than 7,000 jobs in Utah's communities (Southwick Associates, Inc. 2007).

Boating in Utah during 2006 was less than in 1999. The Institute for Outdoor Recreation and Tourism at Utah State University in a 2007 report for Utah State Parks and Recreation, showed 76,000 registered boats in Utah during 2006. Those numbers are a surprising increase of 800 over the previous year. The increase is notable in view of a long-term decline, since the acreage of water available for boating remains relatively constant in Utah. AIS impacts to boaters may further reduce their participation at lakes and reservoirs that become infested, since the boater's favorite lakes are those with quality fishing. For example, *Dreissenid* mussels can plug the water circulation system in boats, causing engines to overheat and become seriously damaged. Eurasian watermilfoil restricts boat use, particularly in the near shore zones. And, more mandatory decontamination protocols are being imposed, so boaters don't inadvertently move AIS while transporting their watercraft between recreation areas. It is estimated that lost revenue in Utah's communities due to decreases in boating could be substantial. Utah boaters annually expend at least $276 million for goods and services supporting their sport, which supports more than 4,300 jobs statewide (Harris 2008).

The two decade long history of *Dreissenid* mussels fouling water conveyance systems just in North America is well documented (O'Neill 1996). Expenditures for maintenance have been significant, with the infested areas spending nearly $100 million per year. *Dreissenid*'s spread across Europe outside their native range has caused similar economic challenges (O'Neill, 1996). No doubt, impacts from *Dreissenid* mussels and other AIS represent real threats to Utah's economy and could alter all Utahan's quality of life. The Utah Division of Water Resources has estimated, based upon maintenance expenditures east of the 100th Meridian, that cost to Utah on an annual basis due to infestation by just *Dreissenids* could exceed $15 million (Pers. Comm. Mike Suflita. 2007. Senior Engineer, Utah Division of Water Resources). That estimate did not include maintenance cost to Utah's 1,200 miles of major pipelines or the vast system of secondary pipelines and irrigation systems within the state, nor Utah's 4,500 miles of canal.

Laws and Programs That Guide AIS Management

The following is a list and short summary of the primary laws and programs that guide the control of AIS on a national basis as it affects Utah. Included are Utah laws and programs.

National AIS Laws

1973 Endangered Species Act: The U.S. Fish and Wildlife Service administers the Endangered Species Act as part of its authority to affect AIS impacts that could extend to a listed species or listed critical habitat. The act, which is Public Law 93-205, has experienced several amendments across the years, and at its onset repealed the Endangered Species Conservation Act of 1969. The 1969 Act had amended the Endangered Species Preservation Act of 1966.

1990 Nonindigenous Aquatic Nuisance Prevention and Control Act: Due to the multitude of environmental and socio-economic impacts posed by AIS, many governmental and non-governmental entities have recognized need for regulation. In 1990 the

Nonindigenous Aquatic Nuisance Prevention and Control Act was passed by Congress and enacted to address AIS problems in the United States, particularly in the Great Lakes. This legislation provided federal cost-share support for implementation of state AIS plans. The 1990 act established the national Aquatic Nuisance Species Task Force, which is co-chaired by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration.

1996 National Invasive Species Act: The reauthorization of the aforementioned Nonindigenous Aquatic Nuisance Prevention and Control Act occurred in 1996 as the National Invasive Species Act. It established a national goal of preventing new aquatic nuisance species introductions and limiting the dispersal of existing AIS in all of the states. The National Invasive Species Act also specified that state AIS plans identify feasible, cost-effective management practices and measures that can be implemented by states to prevent and control AIS infestations in a manner that is environmentally sound.

The act allows the U.S. Fish and Wildlife Service to reimburse entities with approved plans up to 75% for cost of plan implementation. Currently Congress has authorized $4 million annually for that purpose, but only appropriated $1.075 million this year, which provides those with an approved plan about $34,000 annually. This amount is woefully inadequate. Congress must take action to provide a full annual appropriation equivalent to the authorization. Development of Utah's plan cost the state and participating partners nearly $200,000. And, annual plan implementation, funded in part by an ongoing General Fund appropriation of $1.4 million per year by Utah's Legislature, greatly exceeds funds available via the U.S. Fish and Wildlife Service. Partner contributions to date toward plan implementation is in addition to the aforementioned state appropriations and varies annually, but equated to no funds in FY08, $81,000 in FY09 and $160,000 in FY10. Unfunded partners alone, not to mention the State of Utah are doing a better job securing AIS funds than the act allows the federal government to do; yet the authority given by Congress is vested in the federal government.

The 1996 National Invasive Species Act established six Regional Panels across the nation to serve as advisory committees to the national Aquatic Nuisance Species Task Force. Utah's Governor appointed Utah Division of Wildlife Resources to represent Utah as a member on the Western Regional Panel, which is chaired by the U.S Fish and Wildlife Service.

Additionally, the 1996 act authorized the 100th Meridian Initiative as an effort to keep *Dreissenid* mussels east of the 100th Meridian. The initiative resulted in five River Basin Teams. Utah Division of Wildlife Resources is Utah's member on the 100th Meridian's Colorado River Basin Team.

The 1996 National Invasive Species Act directed the U.S. Coast Guard to establish regulations and guidelines to control the introductions of AIS via ballast water discharge into waters of the United States. It also directed the U.S. Army Corps of Engineers to develop a program for research and technology to control *Dreissenid* mussels and to make information available on control methods.

Executive Orders: The 1999 the Executive Order 13112 on Invasive Species established the national Invasive Species Council (Secretaries of State, Treasury, Defense, Interior, Agriculture, Commerce, Transportation, and the Administrator of the Environmental Protection Agency). Its purpose is to oversee activities of existing federal organizations that address invasive species issues in order to increase public awareness, coordinate federal and state activities, provide technical assistance and research, and prevent importation of nuisance species.

Lacey Act: The U.S. Fish and Wildlife Service, amongst other agencies, administer the Lacey Act, which is Public Law 110-246, as part of their authority to prohibit trade in wildlife, fish, and plants that have been illegally taken, possessed, transported or sold. The act, originally passed in 1900, has been amended several times; the most significant ones occurred in 1969, 1981, 1988 and 2008.

Injurious Wildlife Provisions of the Lacey Act (18 U.S.C. 42; 50 CFR 16): This separate code further allows the U.S. Fish and Wildlife Service to regulate and manage activities involving invasive species formally declared to be injurious to the United States. The intent is to prevent introduction or establishment of injurious species, protecting the health and welfare of humans, the interests of agriculture, horticulture or forestry, and the welfare and survival of wildlife resources from potential and actual negative impacts. Additionally, this part of the Lacey Act requires health certificates to accompany all imports of fresh or frozen fish produced commercially, and salmon and trout harvested recreationally outside North American waters, which includes live salmon eggs.

Other Federal Activity That Relate to AIS Management: Many other federal acts and agencies in-part focus upon AIS management. The following actions and laws have significance to Utah.

> The Bureau of Reclamation administers a small, but significant acreage in Utah as "withdrawals" from other federal land management agencies for purposes of managing water development projects. They exercise AIS management on those properties. And, the Upper Colorado River Regional Office for the Bureau of Reclamation is currently preparing a management plan that focuses upon AIS management.
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> The Clean Water Act, administered by the Environmental Protection Agency, strives to eliminate introduction of toxic substances into waters of the United States to ensure that surface waters are suitable for human sports and recreation. Additionally the Clean Water Act regulates discharge of dredge and fill materials into wetlands; enforcement as it relates to wetlands is coordinated by the U.S. Army Corps of Engineers.
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> The Plant Protection Act, administered by the U.S. Department of Agriculture Animal and Plant Health Inspection Service, prohibits introduction and dissemination of plant pests and noxious weeds.

The National Forest Management Act, the Federal Land Policy Management Act, and the National Park Act, administered by the U.S. Forest Service, Bureau of Land Management, and National Park Service, respectively, regulates native species, non-indigenous species introductions and habitat health on a majority of the federal land in Utah. For example, the Bureau of Land Management's Federal Land Management and Policy Act of 1976 (43 U.S.C. 1701 et seq) states that "public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use." Each of these acts are similar in intent.

The Central Utah Project Completion Act, administered by the Utah Reclamation, Mitigation Conservation Commission, besides providing for the completion of the Central Utah Project and maintenance of its facilities, affords enormous mitigation opportunity and perpetual funding for either unrecognized impacts or a continuation of mitigations for wildlife impacts.

The Farm Bill, administered by the Natural Resources Conservation Service, working in close partnership with Utah's Association of Conservation Districts, strives to improve private agricultural lands for wildlife habitat and agricultural purposes. In part, they target management of AIS as they affect production of crops or product from private land.
Note: the Natural Resources Conservation Service manages the National Invasive Species Information Center (www.invasivespeciesinfo.gov).

Several Native American tribes--Navajo, Northern Ute, White Mountain Ute, Northern Goshute, Southern Goshute, Paiute, Shoshone--exist or have hunting and fishing rights within Utah. The Ute Tribe and the Navajo Tribe each control significant areas (e.g. the Navajo Nation borders most of the southern border of Lake Powell and the Ute Nation includes several boating waters) with potential for infestation by AIS, particularly *Dreissenid* mussels. The other tribes have limited resources at risk where AIS could become an issue. The tribes under treaty with the United States maintain absolute authority for resource management on their lands, but are advised by the U.S. Fish and Wildlife Service concerning wildlife management issues.

Several international agreements also afford protection from AIS for the United States.

Utah Laws That Relate to AIS
Utah Division of Wildlife Resources in concert with other partners within the Utah Department of Natural Resources launched an aggressive campaign in early 2007 to:

1. Assess threats from *Dreissenid* mussels.
2. Advise the public, particularly decision makers, of the ecologic and economic

impacts from *Dreissenid* mussels.

3. Develop needed policy to advise divisions within the Utah Department of Natural Resources and other departments within Utah State government about *Dreissenid* mussels and how Utah would react.
   NOTE: NR-07-D-11—"Policy to Prevent Invasion of Zebra Mussel into Utah Waters," assigned the Utah Division of Wildlife Resources as lead agency within Utah to carryout a program.
4. Initiate an emergency "Quagga Mussel Education and Implementation Plan."
5. Secure stable funding to conduct a more robust attack against AIS in general, with *Dreissenid* species being a primary focus followed by a second priority group consisting of New Zealand mudsnail and Eurasian watermilfoil, followed by a third priority group consisting of all other AIS.
   NOTE: The 2008 Utah Legislature appropriated $2.5 million general funds, of which $1.4 million is ongoing, to allow the Utah Division of Wildlife Resources to conduct an AIS program.
6. Develop new laws as needed.
   NOTE: The 2008 Utah Legislature unanimously passed the Utah Aquatic Invasive Species Interdiction Act and the Utah Wildlife Board unanimously passed Rule R657-60, Aquatic Invasive Species Interdiction. The rule allows enforcement of the Act, facilitating enhanced enforcement, which provides authority to make stops of trailered watercraft at boat launch sites, administrative check sites, and Utah ports of entry, including a mandate for self-certification pre-launch certifying mussel free boats. It also allows the closing of water bodies that become infested with *Dreissenid* mussels to ingress/egress of watercraft and other equipment until an acceptable plan for containment and control is developed. The prelude to this action consisted of several months of study by a special team followed by briefings for the Executive Director of the Utah Department of Natural Resources and his multiple natural resource Division Directors; a briefing for Utah's Governor; briefing the Utah Legislature's leadership; and securing a Utah State Senator and a Utah State Representative to introduce the bill into the Utah State Senate and Utah House of Representatives. Many discussions ensued, with negotiated modifications to the bill, but it eventually passed.
7. Develop and implement a comprehensive Utah Aquatic Invasive Species Management Plan.

Utah Code, section 23, establishes Utah Division of Wildlife Resources as the authority for wildlife management in the state, but the authority only extends to species defined as "protected wildlife." Thus, neither Utah Code nor associated rule provides authority for the management of plant species by Utah Division of Wildlife Resources, including those plant species recognized as AIS. Chapters 13 through 27 of section 23 in the Utah Code and an array of associated Utah Rules address wildlife management issues regarding protection, management, take, possession, importation and exportation of protected wildlife, which includes quagga and zebra mussel considerations, making them prohibited species. Chapter 27 is the codification of the 2008 Aquatic Invasive Species Act (Appendix E1), and authority for enforcement of the Act is facilitated by Rule R657-60, Aquatic Invasive Species Interdiction (Appendix E2). The Act and Rule only consider

Dreissenid species, providing greater authority for Utah to interdict watercraft and equipment or inspect waters infested with *Dreissenid* mussels. Utah Division of Wildlife Resources, Utah Peace Officers (includes Utah State Park and Recreation rangers), and Utah Port of Entry Agents now have authority to inspect equipment to determine contamination by *Dreissenid* mussels, particularly equipment that has been at any infested waters within the last 30 days. The authority extends to compelling decontamination as necessary. Additionally the authority allows closure of infested water bodies until the operator has developed a satisfactory plan to control and eradicate *Dreissenid* mussels.

Utah Code [4-2-2L (definitions 4-17 and 4-36-1)] provides the Utah Department of Agriculture and Food authority over noxious weeds, some of which are AIS. Management of AIS plant species in Utah results from interagency cooperation, exercising other agency's or private land owner's authority. Most AIS plant associated management activity in Utah involves cooperative arrangements between Utah Department of Agriculture and Food, Utah Division of Wildlife Resources, and Utah Division of State Lands and Forestry, State Institutional Trust Lands Administration, Utah State Parks and Recreation, along with the aforementioned federal land management and conservation agencies.

Utah Code [72-9-502 (definition 4-1-8)] and Rule R58-1-16(C) requires that all vehicles importing aquatic animals into Utah or through Utah must have documentation (Livestock & Fish Movement Report). Imported aquatic animals and their documentation are subject to inspection either at Utah ports of entry or at Utah Department of Agriculture and Food offices; entry denial, fines, or other action may occur. The Utah Department of Agriculture and Food works cooperatively on aquatic animal importation and transportation with the Utah Division of Wildlife Resources and the Utah Department of Health under a memorandum of understanding. Utah Department of Agriculture and Food provides standards for importation of aquatic wildlife for aquaculture, control of depredating aquatic animals, enforcement of rules, prevention of disease, and spread of disease among and from imported aquatic animals, and regulatory decisions for suspect disease endangerment in fish. They also through the Fish Health Program regulate entry permits for all national and international importations of aquatic animals for aquaculture purposes into Utah. Utah Division of Wildlife Resource and Utah Department of Agriculture and Food work cooperatively to grant health approvals for imported aquatic animals. This oversight extends to federal, state and private aquaculture facilities. And, because live fish (and water) are imported, the fish health approval process is completed for each aquaculture facility on an annual basis. The approval process includes review of current status of AIS at each facility, AIS proximity to each facility, and AIS proximity to export locations. The applicant is required to follow certain procedures to treat, test, or remove AIS from the fish and the water.

Importation of ornamental fish, including those deemed to be AIS, are not effectively regulated, but if the Utah Department of Agriculture and Food or the Utah Division of Wildlife Resources determines that an introduction of ornamental fish poses a disease risk for aquatic animals, then existing rules may be the vehicle to regulate the private

ornamental fish industry to protect against AIS. The spring viremia of carp virus is now applied as needed to ornamental fish.

Additionally, certain "emergency prohibited" and "prohibited" pathogens fit the definition of AIS--viral hemorrhagic septicemia, whirling disease, Asian tapeworm (*Bothriocephalus acheilognathi*), and the trematode *Centrocestus formosanus*. Utah Department of Agriculture and Food requires treatment or testing of all proposed imports that could be host species or carriers or even susceptible hosts of these pathogens. (Note: The Asian tapeworm host list is attached as Appendix F.) In the unfortunate event of an aquaculture facility becoming infested by AIS, quarantine may be imposed where it is reasonably necessary to protect aquatic animals within the state. Release of any live or dead imported aquatic animal into public waters is illegal.

The Utah Code (17B-1-103 and 17B-2a-1003) establishes Water Conservancy Districts as political subdivisions of the State of Utah to develop water supplies for their service areas. They are primarily a wholesaler of water to other agencies (cities), and they own and operate a multitude of water storage, treatment and delivery facilities, some of which are major recreation reservoirs and State Parks. The Water Conservancy Districts have authority to protect and maintain their facilities in face of an AIS threat.

Efforts to Facilitate AIS Management in Utah

Utah Division of Wildlife Resources as a member of the Colorado River Fish and Wildlife Council, the Association of Fish and Wildlife Agencies and the Western Association of Fish and Wildlife Agencies is in constant contact with a multitude of international and national wildlife management agencies and other interested publics attempting to deal with AIS. These groups are regularly stimulated to become more aggressive by the national Aquatic Nuisance Species Task Force, who is proposing that the Western Governors Association meeting in 2008 include the topic of AIS in order to bring more focus on AIS issues from the top administrative office in the various states of the west. Previously in 1998 and 2005, the Western Governors Association passed resolutions 98-018 and 05-11 dealing with "Undesirable Aquatic and Terrestrial Species" and "Undesirable, Invasive Aquatic and Riparian Species," respectively. The Utah Department of Natural Resources already has strong support from the Utah Governor's office and the Utah legislature. The Utah Department of Natural Resources has urged Utah's governor to stimulate other western governors to more fully and aggressively deal with AIS.

Additionally, Utah Division of Wildlife Resources has taken a lead role in the west for initiating an AIS program with significant gubernatorial and legislative support for program budget. As a result, an array of western states have been in constant contact, seeking advice about "how did Utah do it." The Utah Division of Wildlife Resources has shared process and outreach product with an array of western and other states. Regarding the states that surround Utah, Idaho already has an approved AIS plan; Colorado is in the process of preparing a plan; New Mexico is showing progress toward an AIS plan; Nevada and Arizona, also have approved AIS plans. Unfortunately, Wyoming seems to not be doing much, although Wyoming shares Flaming Gorge Reservoir with Utah—the reservoir is at great risk for infestation by *Dreissenid* mussels.

A full time AIS coordinator is now assigned to the Utah Division of Wildlife Resources' aquatic section. An AIS outreach specialist is assigned full time to assist with outreach needs. Also, five full time AIS biologists have been placed in the aquatic section —one in each of Utah Division of Wildlife Resources' five regions. And, 35-55 wildlife technicians have been assigned as seasonal employees in the aquatic section to perform as watercraft inspectors; they were placed at a multitude of priority waters statewide. Most technicians were provided with a trailer-mounted decontamination unit capable of spraying high pressure, scalding (140 degree Fahrenheit) water, which will kill all the AIS known either within or threatening Utah. Five conservation officers have been placed to assist as needed with AIS law enforcement needs, as well.

In an attempt to better implement the plan, particularly early detection and control of *Dreissenid* mussels, Utah Division of Wildlife Resources' Fishery Experiment Station and the Aquatic Research Program have coordinated with Utah State University's Fish and Wildlife Department to assess research opportunity and needs. Early detection could allow attack on an invading population of *Dreissenid* mussels, possibly controlling or eradicating them. Knowledge gained from this research may lead to protocols for early detection of other AIS, too, allowing successful eradication or early control. Availability of funds will direct how and when this research might be implemented.

Additionally, Utah's AIS biologists in 2008 have taken plankton samples from 38 Utah water bodies, for assessment by qualified labs for the presence of *Dreissenids*. The assessment will first use microscopy deploying cross-polarized light. If a positive finding for *Dreissenid* occurs, a portion of the same sample will be molecularly analyzed through two different deoxyribonucleic acid polymerase chain reaction tests (PCR) as a confirmatory assessment.

The *Dreissenid* mussel campaign, beyond water craft interdictions by AIS biologists, technicians and others, including Utah Division of Wildlife Resources' conservation officers, Utah State Parks and Recreation's rangers, other Utah peace officers and Utah Department of Transportation's port of entry agents, is mostly an outreach effort. That effort operates in partnership with the U.S. Fish and Wildlife Service's national "Help Stop Aquatic Hitchhikers" program. This allows coordination amongst all of the states in the nation in order to fight aquatic invasive species. Outreach presentations in Utah and at national meetings about AIS, particularly the quagga and zebra mussel threat, have been made to many interested tribal, federal, state, and local governments or sportsman organizations.

Significant actions for outreach implementation as supported by available budget will continue as follows:

1. Utah Division of Wildlife Resources aided by our many partners, including the Utah Aquatic Invasive Species Task Force, is placing the 100th Meridian Initiative's "Zap the Zebra" brochure (250,000 units per year) statewide at

locations where boaters and anglers will encounter it. During 2007 the effort included direct mail by Utah State Parks & Recreation of the brochure to 65,000 registered boaters in Utah.
NOTE: Utah Division of Wildlife Resources is negotiating with the Utah Division of Motor Vehicles to incorporate an AIS message in their annual vehicle registration packets to boaters, negating a need to direct mail the "Zap the Zebra" brochure in future years. Additionally, the Utah Division of Motor Vehicles' web site links to the AIS segment of Utah Division of Wildlife Resources' web site.

2. Utah State Parks & Recreation is direct mailing a notice annually to all fresh water boat dock users (500 units) in the state park system, detailing the quagga and zebra mussel threat, including need for decontamination of boats and equipment.
3. Utah Division of Wildlife Resources is placing table-top displays (5,000 units per year) across Utah at restaurants, boat dealer counters and other places where boaters and anglers would encounter the message, urging the public to "Help Stop Invasive Mussels," and to properly decontaminate their boats and equipment.
4. Numerous highway billboards are being placed statewide, urging boaters to "CLEAN," "DRAIN," and "DRY" their boats to aid in the fight against the spread of AIS. Billboard presentation equates to 168 months of advertising display.
5. Utah Division of Wildlife Resources is placing signs (1,500 units per year as full color foam core 11" x 17") and identical posters (4,000 units per year as full color 11" x 17") across Utah in areas frequented by boaters and anglers.
6. Utah Division of Wildlife Resources is placing entry signs (150 units per year as full color metal 33" x 54"), similar to the aforementioned poster, that demand self-certification as "mussel free" by boaters prior to launch at all significant water bodies across Utah.
7. The corner stone of the outreach effort, which is directly linked to the watercraft inspections, is a self-certification program for pre-launch boaters to certify that their watercraft have either not been contaminated with *Dreissenid* mussels, or that their boats have been properly decontaminated. Every boater contacted will be asked to certify pre-launch that they have done their part to "Help Stop Aquatic Hitchhikers." Boaters will be presented with a self-certification form and asked to sign and display it on the dashboard of their vehicle. Boaters who arrive at times when no agency personnel are present, will be instructed via the aforementioned metal entry signs to secure a self-certification form and to fill it out, displaying it on their dashboard. Containers making the self-certification form available 24/7 will be mounted with the aforementioned metal entry signs.
NOTE: Launch will not be allowed for boats needing decontamination. And, decontamination units are located at or nearby boating waters in Utah.
8. The National Park Service at Lake Powell has been an outstanding cooperator, aiding the Utah Division of Wildlife Resources and leading by example. They have conducted a similar outreach program as described above and began it several years ago.
NOTE: The National Park Service's *Dreissenid* mussel campaign at Lake Powell has been interdicting boats from contaminated areas and conducting decontamination for several years.

9. A rapid response strategy is included in the Utah Aquatic Invasive Species Management Plan. It will guide the Utah Aquatic Invasive Species Task Force in dealing with new arrivals of AIS or the spread of existing AIS.